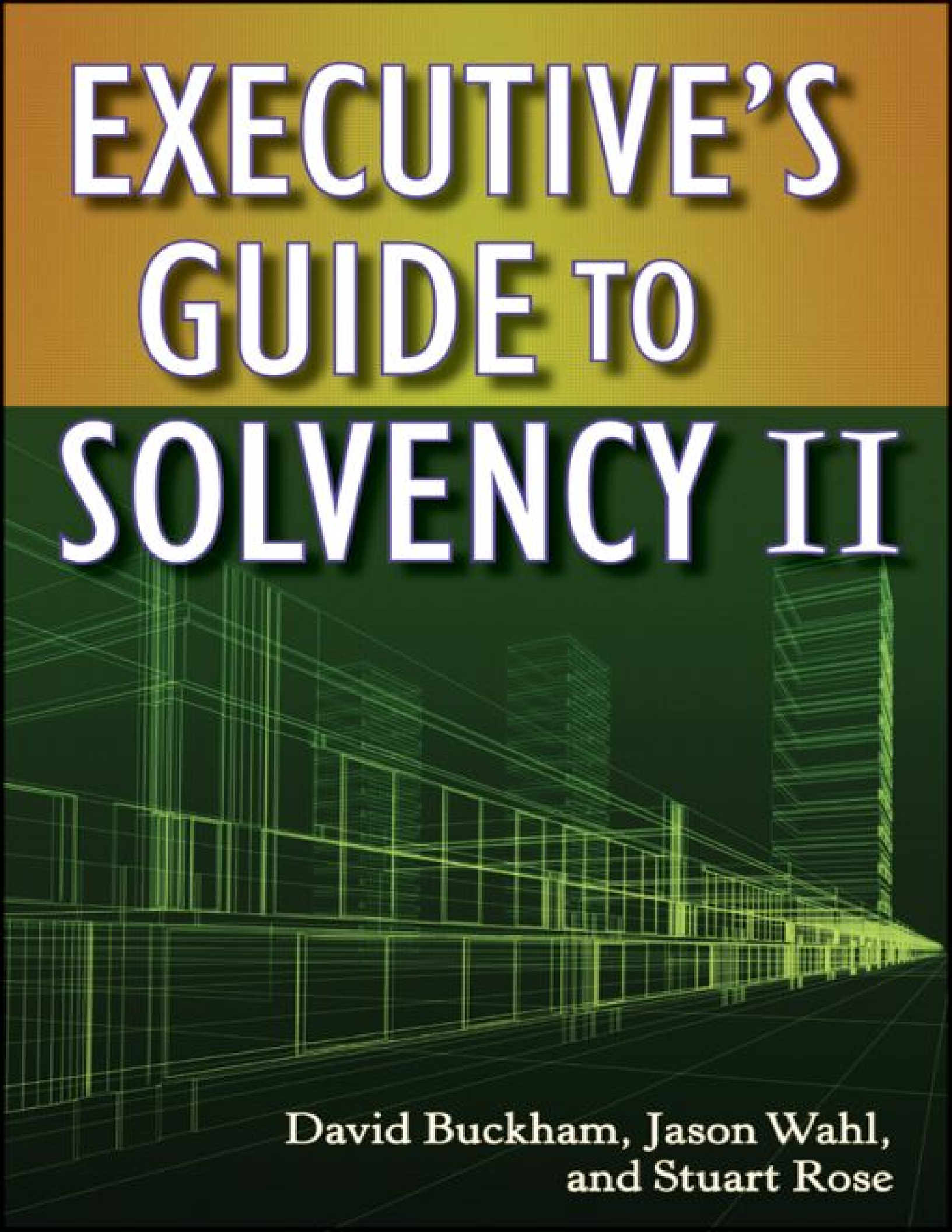
EXECUTIVE'S GUIDE TO SOLVENCY II



David Buckham, Jason Wahl,
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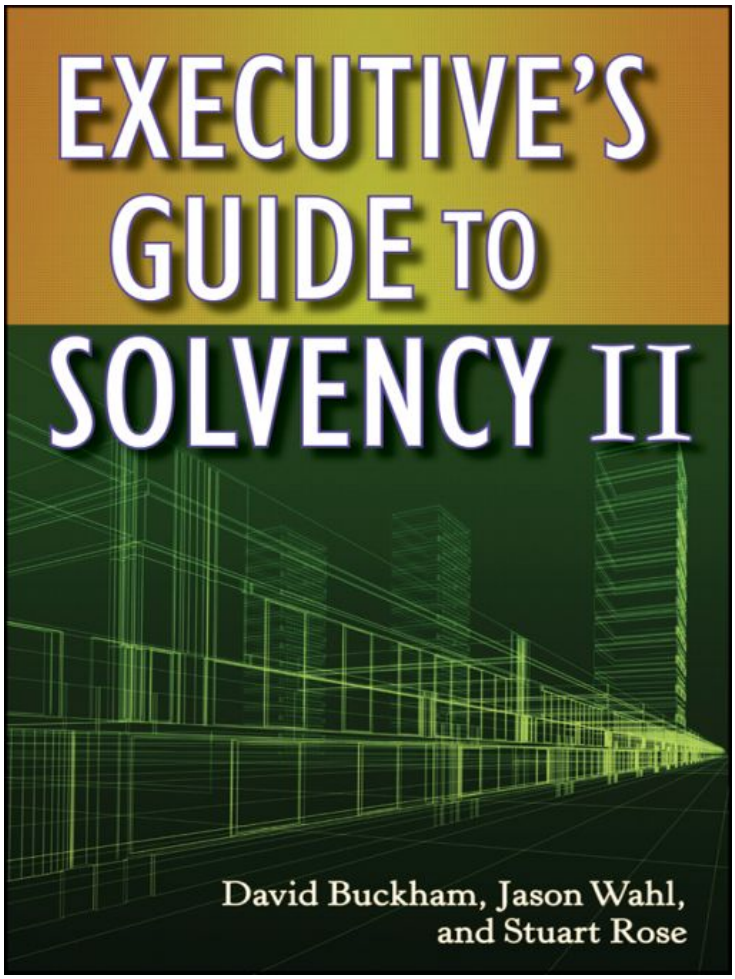
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Table of Contents

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Preface

Solvency II is the directive regulating capital requirements of insurance companies in the European Union (EU). The directive was issued by the European Commission on July 10, 2007, and adopted by the European Parliament on April 22, 2009. It is envisioned that the directive will be implemented across the EU commencing January 1, 2013, being applicable to all insurance and reinsurance companies with turnover greater than €5 million.

The European Commission's 2007 "Solvency II Impact Assessment" estimated the initial cost to the EU insurance industry of implementing Solvency II to be between €2 billion and €3 billion. The expected economic benefits were deemed to outweigh this cost by replacing the formulaic and risk-insensitive capital requirements of Solvency I with risk-based capital requirements, improved risk management, and disclosure.

Debate continues in the prevailing mood of heightened uncertainty as to the appropriateness of financial regulation and attainability of systemic stability. After the recent financial crisis, divergent opinions are being offered on the feasibility of financial reforms and on the method and level of regulation. The principles-based nature of Solvency II represents a sea change in thinking and in logic away from some of the pitfalls of Basel II, the international regulatory framework governing banks, but reinforces the use of sophisticated mathematical methods and also the constructs of supervisory review and market discipline.

There is a danger that executives of insurance corporations will see compliance with the regulation purely as a cost and will be critical because of the financial crisis.

Some outside the industry may even see it as merely the creation of a new cost and barrier to entry for other market participants, impeding a truly competitive and market-driven environment in insurance. However, these cynics are wrong. Solvency II is a well-thought-out directive, painstakingly developed over many years by collaboration between the European Commission, member states, and the insurance industry. It holds the promise of transforming the industry to a common set of standards and principles and, in so doing, creating a more stable insurance industry.

A frequent question asked is whether Solvency II would have preempted the AIG debacle of 2008. No regulatory system is foolproof, but in all likelihood, it would have done so. The holistic three-pillar risk management approach increases transparency of the level and adequacy of capital allocated to risks, and provides for an interventionary buffer between the identification of a problem and ultimate realization of a crisis.

This book explains for executives, practitioners, consultants, and others interested in the Solvency II process and its implications how to move away from cynicism by understanding how and why the directive originated, how it compares to Basel II, what its goals are, and what some of the complexities are. There is an emphasis on what in practice should be leveraged on to achieve implementation, specifically data, processes, and systems. Recognition of the close alignment demanded between actuaries, the risk department, information technology, and the business itself is stressed.

Chapter 1 explores the history of insurance in terms of the need by individuals for financial diversification, the early risk instruments and practices engendered as a result, and continues to the vital role of insurance in the economy

today. Chapter 2 cites the risks to which life, non-life, and health insurers are subject.

Chapter 3 provides a chronology of the Solvency II development process, underscoring its relevance in context of the causes of insurance company failure and the inadequacy of earlier solvency rules.

The continued relevance of regulation in its current institutional genre is considered in Chapter 4. The case is made that blame for the financial crisis cannot summarily be laid at the doorstep of Basel II, and moreover that Solvency II represents a progression in economic risk-based regulation.

Chapter 5 clarifies the structure of the directive in terms of the requirements insurers should fulfill under the three pillars. The risk-based economic balance sheet approach is further elaborated in Chapter 6 by description of the quantitative requirements and their calibration under the standard formula approach.

Chapter 7 considers the techniques, challenges, and complexities of internal models. It emphasizes that the practice of internal modeling encompasses more than the technicalities of building internal models. Internal models must be embedded in the day-to-day operations of the business.

Chapter 8 focuses on the people, processes, and technology that need to be in place to successfully drive an enterprise-wide risk management project. The business benefits accruing to the successful implementation of enterprise-wide risk management is analyzed in Chapter 9.

CHAPTER 1

The Evolution of Insurance

ORIGINS OF RISK

At the dawn of modern human history, widely dispersed groups of tightly knit kin, whom we today refer to collectively as hunter-gatherers, relied almost exclusively on clan relatedness as their only bulwark against the ever-present risk of death, debilitating injury, and starvation. For these early ancestors, the concept of risk can be thought of almost exclusively in terms of the physical persons of individuals, mitigated by the guarantee of personal and kin relationships, rather than objects and possessions.

The later development of agrarian/pastoral societies necessitated almost everywhere the development of the notion of private property as the agricultural revolution made possible the storage of food and hence more complex societies. The efficiency gains accruing to these new social structures enabled specialization of labor into various trades, such as merchants, warriors, and blacksmiths, each requiring tools-of-trade assets.[1] The price of this progress was that individual self-interest was no longer so closely aligned with that of the collective.

Ever since, individuals have recognized their need to mitigate risks that have the potential for ruin, either as a result of the assets they hold or simply by the fact of their existence in this world. In other words, a means was required for individuals to achieve at least a primitive form

of financial diversification. Because risk is nonfungible at the individual level but the outcome of loss is transferable in aggregate, individuals exposed to losses through common risks naturally formed themselves into groups to aggregate those risks, price the risk, and eventually even sell it to investors.

Perceptions of risk and the institutional arrangements that have developed in response closely mirror philosophical advances in society's stance on the sanctity of the persons of individuals. Risk is commonly understood to exist and require management at the level of the individual rather than the group. The market economy is the ultimate expression of this freedom to transact, preservation of which requires the existence of regulations such as Solvency II to protect individuals' rights. While it is apparent that Solvency II and similar regulations are implemented by national regulators acting as agents on behalf of an international body and bestowed on organizations across an industry, the ultimate goal of such regulations is to promote a socially optimal balance between the profit motive of organizations and individuals' rights. Article 27 of the Solvency II Directive states:

> The main objective of (re)insurance regulation and supervision is adequate policyholder protection. Other objectives such as financial stability and fair and stable markets should also be taken into account but should not undermine that main objective.[2]

EARLY RISK INSTRUMENTS

The earliest known instance of insurance dates back to the Babylonian period circa 2250 BC, when the Babylonians developed a type of loan insurance for maritime business.

Examples can be found in the Code of Hammurabi.[3] Upon receipt of a loan to fund his shipment, a merchant would typically pay the lender an additional premium in exchange for the lender's guarantee to cancel the loan should the shipment be stolen or lost at sea. In effect, the lender assumed the perils of the goods in transit at a premium rate of interest. The maritime loan therefore cannot be considered a stand-alone insurance contract, although the practice proved effective enough for it to later be adopted by the Greeks, Romans, and Italian city-states. Somewhat surprisingly, codified Roman law gave no recognition of insurance as separate from the maritime loan, but the precedent of life and health insurance could be recognized in the form of organized burial societies.

Use of the maritime loan persisted until the thirteenth century in the Italian city-states of Genoa and Venice. Rigorous application of financial principles,[4] as well as the city-states' great fortune in escaping the stifling yoke of feudalism on commerce and trade and their convenient geographic location at the interstices of Eastern and Western culture, had given these merchants a commercial advantage, establishing a wealthy trading region. But maritime commerce sustaining the economies of these city-states was conducted at the mercy of natural and human hazards. Shipwreck by storm or even poor navigation was common. Ships and their cargoes were constantly in danger of being seized by pirates or corrupt officials, or made to pay exorbitant tolls for safe passage.

Nonfinancial measures were the primary mitigants of these risks, including steering clear of passages known to be dangerous—requiring collaboration, record keeping, and exchange of information—arming ships as a deterrent to pirates, and diversifying risk by splitting up a cargo among several vessels.

Financial risk diversification was already well established by this time in the form of joint stock ventures, pooling goods of a number of merchants to be sold jointly.[5] Ventures pooling goods in joint stock allowed for risk diversification at the level of the individual investor. This provided merchants the opportunity to contribute a fraction of their wealth to the equity of a venture, thereby gaining a pro rata risk-return exposure to its success. If the ship went down, the loss would be spread among a number of investors, diversifying risk at both investor and product level.

The risk diversification benefits of this arrangement were, however, limited, as the combination of market risk, peril risk (i.e., the complete loss of ship and cargo), and business risk demanded a greater than optimal degree of managerial attention from investors. Another limiting factor was that the risks were not individually hedged, but lumped together. Separating peril risk out of this risk mix lowered the cost of equity by transferring the peril risk to an external party able to bear it at a lower cost. Such specialists assumed the peril risk through the maritime loan, repayable upon the safe return of a vessel and its cargo but written off in the event of loss. The system was imperfect, however, as the debt instrument exposed the specialist to counterparty risk in addition to peril risk.

The maritime loan was thus not entirely fit for its purpose. The lender had only downside risk; with a debt instrument, there is no upside reward for the counterparty risk incurred in addition to peril risk. Borrowers, however, could only insure their venture in combination with a relatively expensive source of finance.

From about the late fourteenth century on, merchant bankers began to split the finance and insurance components by drawing up separate contracts for the debt

and the marine insurance. The advent of marine insurance, the oldest of the modern lines of insurance business, thus separated credit risk from peril risk, reducing the cost of both.

This innovation spread through the Mediterranean, to the Adriatic, and the Low Countries, eventually being adopted in England some 300 years later. At the time there was growing demand to finance and insure voyages to the new colonies of the British Empire. Famously, merchants, ship owners, and underwriters would meet at Lloyd’s Coffee House in London to finance these ventures. Lloyd’s developed into an association of underwriters, so called because insurance policies were backed by a number of individuals, each of whom would write his name and the amount of risk he was assuming underneath the insurance proposal. The term “underwriting” is today synonymous with Lloyd’s, but in fact originated in the Italian city-states.

The practice of marine insurance required Genoese and Venetian merchants to evaluate structural and contingent risks involved in maritime trade, such as the type of vessel, reputation of the captain, destination, season, cargo, piracy, corruption, and war. Although these merchants did not formalize the concept of probability in the statistical sense, they nevertheless relied on intuition, subjective experience, and objective records to guide their estimation rather than on formal probabilistic reasoning based on actuarial evidence.

Despite the lack of objective mathematical foundation, widespread markets and instruments existed for risk mitigation and risk taking by the late fifteenth century. Not only were commercially driven hedging and speculation common practice, but institutionalized gambling in the form of lotteries even became popular. Principalities found that public works projects could be financed from the proceeds

of lotteries rather than by recourse to public funds. The widespread popularity of gambling stimulated an interest in probability theory among Jacob Bernoulli, Abraham de Moivre, and others. Their scientific treatment of the subject laid the foundations for the establishment of statistics as a branch of mathematics in its own right.[6] Bernoulli found estimates for binomial sums, which today are known as Bernoulli trials, while de Moivre was the first person to make the leap from the binomial to the normal distribution, typically known as the *bell curve* or *Gaussian* distribution, as a continuous exponential approximation of the binomial distribution.

More so even than fear of loss or compulsion to gamble, mortality is of course a common human preoccupation. The first example of modern life insurance was issued in January 1536 to William Gybbons of London. The policy was a one year term policy, according to which Gybbons's beneficiaries would receive £400 in the event of his death in exchange for a premium of £32. Interestingly, William Gybbons did die within the next 12 months, and his underwriters had to pay the death benefit. Given that the first mortality table would be created more than 150 years later, the underwriting of this policy was certainly akin to gambling.[7]

Insurance originally evolved as a commercial instrument, and it was not until after 1666, as a result of the Great Fire of London, that insurance for households, aptly named "Fire Insurance," emerged. The aftermath of the Great Fire saw the creation by Dr. Nicholas Bardon of the first insurance company, The Insurance Office, in 1667. To protect the houses and other buildings it was insuring, The Insurance Office formed actual firefighting teams. It issued badges known as firemarks for its insured properties; its firefighting teams extinguished fires exclusively in buildings bearing the

firemarks. Other insurance companies soon followed and employed their own fire departments. Obviously this concept of each insurance company having its own fire department proved to be disastrous. Eventually a deal was worked out, and all the insurance companies agreed to donate their equipment to the city to create municipal fire departments.

Although fire insurance was initially restricted to houses, it was soon expanded to include business premises. Underwriting the risk of business premises burning down initially presented insurers with problems in assessing risk premiums, but by 1720, a group of London insurers had introduced risk classifications to make insurance available even to hazardous trades.

What happened to The Insurance Office is unknown. However, the oldest documented insurance company still in existence today began life as a fire office. Originally known as the Sun Fire Office, after many mergers and acquisitions it is now recognized as RSA, one of the largest insurers in the United Kingdom.

The development of maritime trade insurance, and later of other types of commercial and personal insurance, stimulated the creation of what we today consider pseudofinancial instruments and contracts in the diversification and mitigation of risk. Yet in the early days, the actual mathematical measurement of these risks, other than in a purely qualitative sense, was not widespread. Fine quantitative distinctions evidenced in actuarial opinions today, based on rigorous scientific method and subject to statistical scrutiny, represent a quantum leap over the rough-and-ready risk assessment techniques of yesteryear.

ROLE OF INSURANCE IN ECONOMIC GROWTH AND PROSPERITY

From its early inception as predominantly a maritime instrument until the present day, insurance has grown significantly in scope, purpose, and availability. Today the insurance industry contributes to economic growth and national prosperity in various ways. At the macro level, the industry helps strengthen the efficiency and resilience of the economy by facilitating the transfer of risk. At the micro level, it brings benefits in all areas of day-to-day life. Insurance helps individuals minimize the financial impact of unexpected and unwelcome future events, and helps them organize their businesses and their lives with greater certainty. Risk-averse individuals are able to enjoy greater utility from their most important assets via the purchase of insurance products. Almost every conceivable asset or activity can be insured through familiar product types, such as motor, travel, and home content insurance, and by business through professional and product liability insurance, cover for business interruption, and many other contingencies.

As a vital tool for the management of risk by both individuals and organizations, whether private or public, insurance plays an important role in the economic, social, and political life of all countries. Quantifying the contribution of insurance to economic growth is, however, far from simple. One such attempt was made in 1990 by J. Francois Outreville, who investigated the economic significance of insurance in developing countries. By comparing 45 developed and developing countries, he was able to show that there is a positive but nonlinear relationship between insurance premiums per capita and gross domestic product per capita, demonstrating that the development of

insurance as a financial instrument clearly plays an important role in assisting a nation’s economic growth.

An example of how insurance supports economic growth can be demonstrated by its impact on the private residential homes market. Without home insurance (i.e., structure and contents insurance), households would be unwilling to invest most of their wealth in a single property and would have to rent properties from commercial landlords. Hence, insurance enables members of the general public to be homeowners and supports the private housing market. It could even be argued, in fact, that insurance directly influenced the growth of democracy in the United Kingdom, since the vote was initially limited to homeowners.

Another illustration of how insurance supports risk taking and economic growth is that of the North Sea oil industry from the 1970s. The oil drilling platforms required to operate in the North Sea were not only extremely expensive to construct, but also had to work at depths and contend with conditions not previously experienced in the industry. The financial capacity of the London insurance market, and moreover its willingness to insure new and costly technologies, supported the successful development of the North Sea oil industry and the subsequent economic growth of several northern European countries.

The insurance industry also provides mechanisms that enable individuals to pool their savings to meet financial objectives, such as providing for retirement. Individuals benefit from economies of scale in accessing capital markets, reducing transaction and information costs, thereby improving the trade-off they face between risk and expected return. As a result, insurance companies are a key link in the investment chain that enables firms to finance investment and savers to smooth income over their lifetimes. The operation of the investment chain is critical to

the efficient allocation of capital across the economy and therefore to improving productivity and competitiveness.

Today, in the rare instance in which commercial insurance is not available to business, alternative risk-sharing mechanisms soon arise to fill the gap. For example, in the mid-1980s, a crisis in the U.S. liability insurance market dramatically reduced the levels of cover available, particularly to large industrial companies, and a sharp increase in premium levels ensued. The response by the U.S. manufacturing industry was immediate, and new mutually owned insurance groups were quickly set up in Bermuda and other tax-haven countries to replace the missing insurance cover.

CONCLUSION

From its origins in ancient times, insurance has evolved in response to the need for individuals to mitigate against or diversify from the risks that they confront in their commercial activities, and later to guarantee their personal health and the financial well-being of their families through life and health insurance. Pooling and diversification of these risks has progressed to become a scientific discipline, in the process creating positive economic externalities at both micro and macro levels.

Today it is estimated that over 5,000 insurance and reinsurance companies operate in Europe. A well-regulated insurance industry provides economies with a reliable mechanism for pooling and transferring risk and in so doing enables greater levels of economic activity. Consumer confidence in the insurance industry is fundamental to its success. Without confidence in the ability of insurers to pay

legitimate claims, the economic benefits of risk transfer would be undermined.

CHAPTER 2

Insurers' Risks

INSURABLE AND UNINSURABLE EVENTS

Because the risks confronting life and non-life insurers are quantified under Solvency II with the ultimate purpose of policyholder protection, the introduction to this chapter attempts to distinguish risk from the point of view of insured and insurer. The remainder of this chapter classifies the diverse types of risk to which insurers are exposed. It is worth bearing in mind throughout this list of risk types that the Solvency II framework is principles-based, not rules-based, precisely because of the complexity of the risk landscape confronting insurers.

From the point of view of an insurer, the only constraint on underwriting a particular risk, however obscure, is that it must be able to be priced. If we are able to price risk, then we are able to insure it. Many of the risks we face as individuals are uninsurable due to fundamental uncertainty, where "uncertainty" refers to the infinite possibilities that the whims of fate and quirks of fortune may bestow.[1] The distinction between risk and uncertainty is an important one. For both insurer and insured to benefit from the contract, an insurable risk must be identified, the variability of which is quantifiable in terms of probabilities, as opposed to the uncertainty of an unquantifiable adverse event.

From the point of view of the insured, vital insurance contracts provide financial diversification from events that

are likely to occur with some probability, such as a house burning down or a person dying unexpectedly, and that are also likely to prove financially ruinous if realized. In addition to diversifying from the possibility of financial ruin, many insurance contracts, such as household contents insurance, for example, satisfy individuals' risk aversion.

For the insurer to adhere to the principle of measurability, insurable risks need to be unambiguously defined with regard to a specified set of events, occurring within a specified time interval, any claim against which is constrained to a maximum specified severity, for the consideration of an up-front premium. These specifications allow the insurer to maximize the potential efficiency gains from the pooling of risk. As the number of participants in a pool increases, total risk per participant, and hence premium, decreases as risk is spread by diversification across risk objects, geographical locations, and sectors of the economy.

Efficiency is further enhanced by economies of scale as underwriting expertise becomes progressively refined by experience of claims history. From the point of view of the supply of insurance as a service, it is thus advantageous to an insurer to be large, as economies of scale yield benefits to the insurer in terms of diversification and estimation.

RISK TAXONOMY

According to the Insurer Solvency Assessment Working Party of the International Actuarial Association,[2] the five major risk types are categorized as:

1. Underwriting risk
2. Market risk
3. Credit risk

4. Operational risk
5. Liquidity risk

Barring liquidity risk, these are the risks that attract a regulatory capital charge under the Solvency II framework, whether the standardized or internal models approach is followed. The Working Party recommended in 2004 that liquidity risk be assessed separately under Pillar 2 of the framework. The five risk categories are presented separately, but it should be recognized that these risk categories do not exist independently of one another. In life products, for example, asset and liability risks are modeled together in an integrated way.

The Working Party investigated the taxonomy of risk as applicable to the Solvency framework given the experience of the insurance industry over the past several years. The document is remarkable in scope and depth but can be quite technical. Many insights have ongoing validity, referring to potential pitfalls in the modeling of risk. Perils modeled by actuaries are presented as being of necessity subject to the reflection of volatility risk, uncertainty risk, and extreme event risk in the modeling tools.

These pitfalls in the modeling of risk more generally have been borne out by the banking and credit crisis. Market events of 2008 onward have highlighted the importance of giving due regard to the possibility of negative outcomes occurring far more frequently than normal distributions or standard models would suggest. In particular, the rational expectations and efficient markets hypothesis tenets of the Chicago School have been criticized.[3]

UNDERWRITING RISK